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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/523,463	06/13/2005	Jurgen Pawlik	12834-00005-US	7585

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EXAMINER	
HAN, KWANG S	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,463	PAWLIK ET AL.	
	Examiner	Art Unit	
	Kwang Han	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 April 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2 and 4-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 4-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

MEMBRANE ELECTRODE UNIT COMPRISING A POLYIMIDE LAYER

Examiner: K. Han SN: 10/523,463 Art Unit: 1795 June 9, 2010

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 9, 2010 has been entered.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The amended title as presented in the response filed on April 9, 2010 does not include the original title.

Claim Rejections - 35 USC § 102

3. The claim rejections under 35 U.S.C. 102(b) as being anticipated by Pineri et al. on claims 9 and 10 are withdrawn, because of Applicant's arguments.

4. Claims 1-3, 12, 14, 15, 24, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Pineri (WO 2002/046278 using US 2004/0058216 for translation and citation).

Regarding claims 1, 15, and 24, Pineri discloses an ion conducting membrane for a fuel cell comprising polyimide layers on the two surfaces (1, 3) of the membrane forming a frame structure conferring mechanical properties on the assembly (Figure 1), surrounding the inner portions [0024] and in contact with the electrode [Abstract, 0006, 0007]. An ion conducting membrane with electrodes used for a fuel cell forms a membrane electrode assembly.

Regarding claim 2, Pineri discloses the thickness of the polyimide layer to be between 1 to 10 microns [0053].

Regarding claims 12 and 25, the teachings of Pineri as discussed above are herein incorporated. It is noted that claims 12 and 25 are product-by-process claims. "Even though product-by-process are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The membrane electrode assembly of Pineri is similar to that of the Applicant's; Applicant's method of forming a membrane electrode assembly is not given patentable weight in the claims.

Regarding claim 14, Materials used for electrodes inherently have some degree of compressibility.

Claim Rejections - 35 USC § 103

5. Claims 4, 5, 7, 17-19, 26, 29, 30, 34, 35, 39, 44, and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 15 above and further in view of Cavalca et al. (US 6300000).

Regarding claims 4, 17, 18, 27, 29-30, and 32, the teachings of Pineri as discussed above are herein incorporated. Pineri is silent towards the electrode having an electrochemically active area whose size is at least 2 cm^2.

Cavalca teaches a fuel cell electrode assembly with examples having a 25 cm^2 active areas with a performance output values showing milliamps per unit area (Column 22, Lines 30-63). It is well known and obvious to one of ordinary skill in the art to vary the size of the active area of the electrode for a fuel cell dependant on the power requirements for the system.

Regarding claims 5, 7, 19, 35, and 39, Pineri is silent towards at least one of the polyimide layers being coated with fluoropolymers.

Cavalca teaches the use of a hydrophobic component such as a fluoropolymer including FEP (tetrafluoroethylene/hexafluoropropylene copolymer) concentrated at the electrode-membrane interface for the benefit of improving water repellency in the electrode structure (13:18-26). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a coating or layer of a fluoropolymer because Cavalca teaches it provides for improving water repellency in the electrode structure.

Regarding claim 26, Pineri discloses the thickness of the polyimide layer to be between 1 to 10 microns [0053].

Regarding claims 29 and 30, Pineri discloses the material of the proton conducting membrane to be doped with phosphoric acid [0050, 0052].

Regarding claim 32, the teachings of Pineri as discussed above are herein incorporated. It is noted that claim 32 is a product-by-process claim. "Even though product-by-process are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F. 2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). The membrane electrode assembly of Pineri is similar to that of the Applicant's, Applicant's method of forming a membrane is not given patentable weight in the claims.

Regarding claim 34, Materials used for electrodes inherently have some degree of compressibility.

Regarding claim 44, Pineri discloses the ion conducting membrane to be part of a fuel cell membrane electrode assembly [Abstract].

Regarding claim 45, Pineri discloses the ion conducting membrane for a fuel cell comprising polyimide layers on the two surfaces (1, 3) of the membrane and in contact with the electrode overlapping with the electrode[Abstract, 0006, 0007].

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri in view of Cavalca et al. as applied to claim 5 above and further in view of D'Agostino et al. (US 4012303).

Regarding claim 6, the teachings of Pineri and Cavalca as discussed above are herein incorporated. Pineri and Cavalca are silent as to the thickness of the fluoropolymer layer.

D'Agostino teaches a fluoropolymer film layer (FEP) useful as a membrane for fuel cells [Abstract] having film thicknesses up to 10 mils (254 microns) to provide mechanical strength and resistance to back pressure (3:58 - 4:8). It would have been obvious to one of ordinary skill in the art at the time of the invention to have a fluoropolymer film layer to have a thickness up to 10 mils thick because D'Agostino teaches it provides mechanical strength and resistance to back pressure when used in a fuel cell assembly.

7. Claims 8-11 and 13 rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 10 above and further in view of Savinell et al. (US 5525436).

Regarding claim 8, the teachings of Pineri as discussed above are herein incorporated. Pineri teaches the electrolyte membrane to be comprised of sulphonated polyimides but is silent towards the membrane comprising polyazoles.

Savinell teaches solid polymer electrolytes to be comprised of various polymers containing basic groups that can form complexes with stable acids or polymers containing acidic groups such as polyimidazoles, polybenzoxazoles, etc. to form solid polymer electrolytes which are stable and retain sufficient ionic conductivity at high temperatures (2:51-67). It would have been obvious to one of ordinary skill in the art at

the time of the invention to have the electrolyte membrane to include polyazoles because Savinell teaches these polymers can form complexes with stable acids or polymers containing acidic groups to form a membrane which are stable and retain sufficient ionic conductivity at high temperatures.

Regarding claims 9-11 and 13, Pineri is silent towards a membrane doped with phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (10:8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

8. Claim 16-18, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claims 1 and 19 above and further in view of Bonk et al. (US 6399234).

Regarding claims 16-18 and 23, the teachings of Pineri as discussed above are herein incorporated.

Bonk teaches a typical fuel cell assembly where the electrodes (32, 34) and the thermoplastic material completely cover the membrane (48) (Figures 1, 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to have

the electrode completely cover the membrane because Bonk teaches this structure is typical for a fuel cell assembly.

Regarding claims 20 and 21, the teachings of Pineri as discussed above are herein incorporated. Pineri discloses the two polyimide layers but is silent towards the layers extending beyond the membrane.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which is bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

9. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri as applied to claim 1 above, and further in view of Bonk et al. and Okamoto et al. (JP 2001-196082, machine translation).

Regarding claim 22, Pineri discloses the polyimide layer to be on the opposing sides of the membrane but is silent towards the polyimide layers to be in contact with the separator plates.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange

membrane which are bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

Okamoto teaches an electrode unit structure for a fuel cell which provides a polyimide seal in contact with the electrode, membrane, and the separators at the peripheral regions to provide a seal to prevent the loss of moisture and acid [0012] (Drawing 1). It would have been obvious to one of ordinary skill in the art to combine the teachings of Bonk and Okamoto to form a polyimide layer further extended as a seal in Pineri's membrane structure because Okamoto teaches that a polyimide seal prevents the loss of moisture and acid within the fuel cell structure.

10. Claims 28, 31, and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al. as applied to claims 5 above, and further in view of Savinell et al.

Regarding claim 28, the teachings of Pineri as discussed above are herein incorporated. Pineri teaches the electrolyte membrane to be comprised of sulphonated polyimides but is silent towards the membrane comprising polyazoles.

Savinell teaches solid polymer electrolytes to be comprised of various polymers containing basic groups that can form complexes with stable acids or polymers

containing acidic groups such as polyimidazoles, polybenzoxazoles, etc. to form solid polymer electrolytes which are stable and retain sufficient ionic conductivity at high temperatures (2:51-67). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrolyte membrane to include polyazoles because Savinell teaches these polymers can form complexes with stable acids or polymers containing acidic groups to form a membrane which are stable and retain sufficient ionic conductivity at high temperatures.

Regarding claim 31, Pineri discloses a membrane doped with phosphoric acid but is silent towards the concentration of the phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (10:8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

Regarding claim 33, Pineri discloses a membrane doped with phosphoric acid but is silent towards the concentration of the phosphoric acid.

Savinell teaches a proton conducting membrane for a fuel cell that is doped with phosphoric acid to about 50 wt% [Abstract] (10:8-22) for forming a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a

membrane doped with phosphoric acid to 50 wt% because Savinell teaches this produces a polymer electrolyte membrane capable of conducting protons in temperatures excess of 100°C.

11. Claims 36-38, 40-41 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al. as applied to claim 35 above, and further in view of Bonk et al.

Regarding claims 36-38 and 43, the teachings of Pineri as discussed above are herein incorporated.

Bonk teaches a typical fuel cell assembly where the electrodes (32, 34) and the thermoplastic material completely cover the membrane (48) (Figures 1, 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to have the electrode completely cover the membrane because Bonk teaches this structure is typical for a fuel cell assembly.

Regarding claims 40 and 41, the teachings of Pineri as discussed above are herein incorporated. Pineri discloses the two polyimide layers but is silent towards the layers extending beyond the membrane.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which is bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be

extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

12. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al. applied to claim 5 above, and further in view of Bonk et al. and Okamoto et al. (JP 2001-196082, machine translation).

Regarding claim 42, Pineri discloses the polyimide layer to be on the opposing sides of the membrane but is silent towards the polyimide layers to be in contact with the separator plates.

Bonk teaches a PEM fuel cell which employs thermoplastic film layers which are extended to the edge of the fuel cell components such as the proton exchange membrane which are bonded and sealed to reduce the likelihood of introducing contaminants to the membrane (8:47-57; Figure 2). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide layer to be extended beyond the membrane and to be bonded because Bonk teaches this type of film layer structure for a fuel cell seals and reduces the likelihood of introducing contaminants to the membrane.

Okamoto teaches an electrode unit structure for a fuel cell which provides a polyimide seal in contact with the electrode, membrane, and the separators at the peripheral regions to provide a seal to prevent the loss of moisture and acid [0012] (Drawing 1). It would have been obvious to one of ordinary skill in the art to combine

the teachings of Bonk and Okamoto to form a polyimide layer further extended as a seal in Pineri's membrane structure because Okamoto teaches that a polyimide seal prevents the loss of moisture and acid within the fuel cell structure.

13. Claims 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri and Cavalca et al. as applied to claim 5 above, and further in view of Steck et al. (US 5464700).

The teachings of Pineri and Cavalca as discussed above are herein incorporated.

Regarding claims 46 and 47, Pineri and Cavalca are silent towards the overlap of the frame or the frame not covering the free electrode area.

Steck teaches that a gasketed membrane electrode assembly can employ gasketing material at the periphery for a specific percentage (6:64-7:34) of the ion exchange membrane rather than the membrane itself as a gasket because it provides a seal between the separator plates that is more effective and economical than assemblies employing the membrane itself [Abstract]. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ a gasketing material at the periphery of the ion exchange membrane to act as a frame because Steck teaches this provides a seal between the separator plates that are more effective and economical than assemblies employing the membrane itself. It has been held that prior art which teaches a range overlapping or touching the claimed range anticipates if the prior art range discloses the claimed range with “sufficient specificity” (MPEP 2131.03).

14. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pineri et al. as applied to claim 1 above, and further in view of Debe et al. (US 6042959).

The teachings of Pineri as discussed above are herein incorporated.

Regarding claim 48, Pineri is silent towards the polyimide to contain repeating units defined by Formula VI.

Debe teaches a membrane electrode assembly which employs a composite membrane [Abstract] which includes an organic substrate which are stable at annealing temperatures, maintain integrity at high temperatures and vacuum imposed on them formed from polymers such as Kapton polyimide film (polyimide containing repeating units defined by Formula VI; 9:56-10:4). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a polyimide film formed from polymers such as Kapton polyimide in the membrane electrode assembly of Pineri because Debe teaches these polymers are stable at annealing temperatures, and maintain integrity at high temperatures and vacuum.

Response to Arguments

15. Applicant's arguments filed April 9, 2010 have been fully considered but they are not persuasive.

Applicant's principal arguments are:

(a) the Pineri reference is silent to any gasketing material, where the instant invention deals with gasket frames,

(b) the structure implied by the process steps in claims 12 and 25 are inevitably different from that of Pineri and are patentably distinct,

(c) the Cavalca and D'Agostino reference teaches the grafting of monomers on a film such as FEP film and is not a coating on a polyimide film,

(d) the Bonk, Okamoto, and Steck reference do not teach an arrangement whereby the subgasket is between the electrode surface and the membrane surface in a frame design, and

(e) use of impermissible hindsight reconstruction.

In response to Applicant's arguments, please consider the following comments:

(a) the limitation to independent claim 1 do not require a gasketing material or a gasket frame. The drawing as shown in the Applicant's response cannot be used to further define the use of the term "frame" in the claims, whether evidenciary or not, as it is not part of the original disclosure. The rejection as presented above meets the limitations of the claim requiring polyimide layers on each surface of the electrolyte membrane in a frame structure,

(b) the process steps as presented in claims 12 and 25 requires the formation of a polyimide layer on the membrane which is met by the structure of the polyimide layers as presented in Pineri. These process steps do not further structurally limit these layers,

(c) as discussed in the rejection Pineri was modified by the teaching of Cavalca which recites fluropolymer component concentrated at the electrode-membrane

interface, this concentrated interface effectively forms a coated layer. The D'Agostino reference provides for motivation to meet the limitations of claim 6 which require a minimum thickness requirement for the coated layer, the fact that the layer is taught as a film does not teach away from the requirements for the thickness,

(d) as discussed above, the limitations of the claims do not require the presence of a subgasket between the electrode surface and the membrane surface in a frame design. Pineri discloses the polyimide layers formed between the membrane and the electrode which is modified by the teachings of Bonk, Okamoto, and Steck to provide for an extension of the polyimide layers for various reasons including reducing the likelihood of introducing contaminants to the membrane, preventing the loss of moisture/acid, and to act as a seal, and

(e) In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Contact/Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kwang Han whose telephone number is (571) 270-5264. The examiner can normally be reached on Monday through Friday 8:00am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. H./
Examiner, Art Unit 1795

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 1795